POLLUTION CRISIS MANAGEMENT GUIDELINE FOR INDUSTRIAL PLANTS IN INDUSTRIAL ESTATE IN THAILAND

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ABSTRACT

Aim: *This research investigates the characteristics of management guideline for pollution crisis from industrial plants in industrial estate in Thailand.*

Methodology: *The model has been simulated from the findings of both qualitative and quantitative of 500 questionnaires distributed to managers/administrators of the industrial business enterprises in Thailand that won the global ISO 14001 or green industry rewards. The data were analyzed by descriptive categorized into light and heavy industries, and by SEM to conduct the model in compatible with the empirical data.*

Finding: *The result reveals that: 1) the pollution crisis management guideline for industrial plants in industrial estate in Thailand consists of 4 factors i.e. policy, knowledge management, innovation & technology and resource management. The managers/administrators gave very high importance at 4.18 on light industry and 3.80 on heavy industry respectively. The analysis of the importance on each aspect shows high importance in most factors, 2) the development of SEM shows that the model fits with the empirical data at the 0.051 Chi-square probability levels, relative Chi-square at 1.243, goodness of fit index at 0.970 and root mean square error of approximation at 0.022. 3) The hypothesis result shows the following influencing factors: knowledge management has direct influence on policy at the statistically significant level of 0.05), knowledge management has direct influence on innovation and technology at the statistically significant level of 0.001, knowledge management has direct influence on resource management at the statistically significant level of 0.01, innovation & technology has direct influence on policy at the statistically significant level of 0.05 and innovation and technology has direct influence on resource management at the statistically significant level of 0.05.*

Conclusion: *The pollution crisis management guideline for industrial plants in industrial estate in Thailand four main factors which are very high important on resources in industrial business of both light and heavy industries. The factors are ranked according to their important levels referred Likert's scale as follows: policy, knowledge management, innovation & technology and resource management. Both light and heavy industries give the most important factor on resources to be guideline for industrial plants in industrial estate for Thailand. The evaluation of structural equation modeling of the simulation model in pollution crisis management showed passing the criteria of the model fitting with the empirical data. It was found that Chi-square probability levels equaled 0.051, relative Chi-square was 1.243, goodness of fit index was 0.970 and root mean square error of approximation was 0.022.*

Keywords: Pollution Crisis, Industrial Estate, Structural Equation Model (SEM).

INTRODUCTION

Thailand has been progressively developing industrial sectors since 1987 with rapid growth rate playing an important role in driving national economic growth rate including Thailand overall economic development. Ratio of Manufacturing Production Index (MPI) on Gross Domestic Product (GDP) in 2017 reaching 3.9% (approximately 15.45 trillion Baht) has been expanded or economic growth is considered important (Office of Industrial Economics, 2018).

According to the policy of foreign investment since 1987, eastern seaboard has been developed and effecting on rapid growth of industrial plants in the east. It was found that there were 3,919 eastern industrial plants during 2008-2017 (Department of Industrial Works, 2018) enabling Thailand development to developing countries with positive economic growth.

The development eastern seaboard, however, has caused gradually increased pollution problems in Thailand. Severe pollution problems are air, water, noise, soil and light (Office of Industrial Economics, 2018). In addition, it also integrally effects on health crisis from cancers, contact or inhalation of chemical substances, respiratory syndrome caused by smog, dermatological diseases caused by air from plants (National Economic and Social Development Board, 2018). Environmental pollution is therefore the very first top national main problems as show in Figure 1.

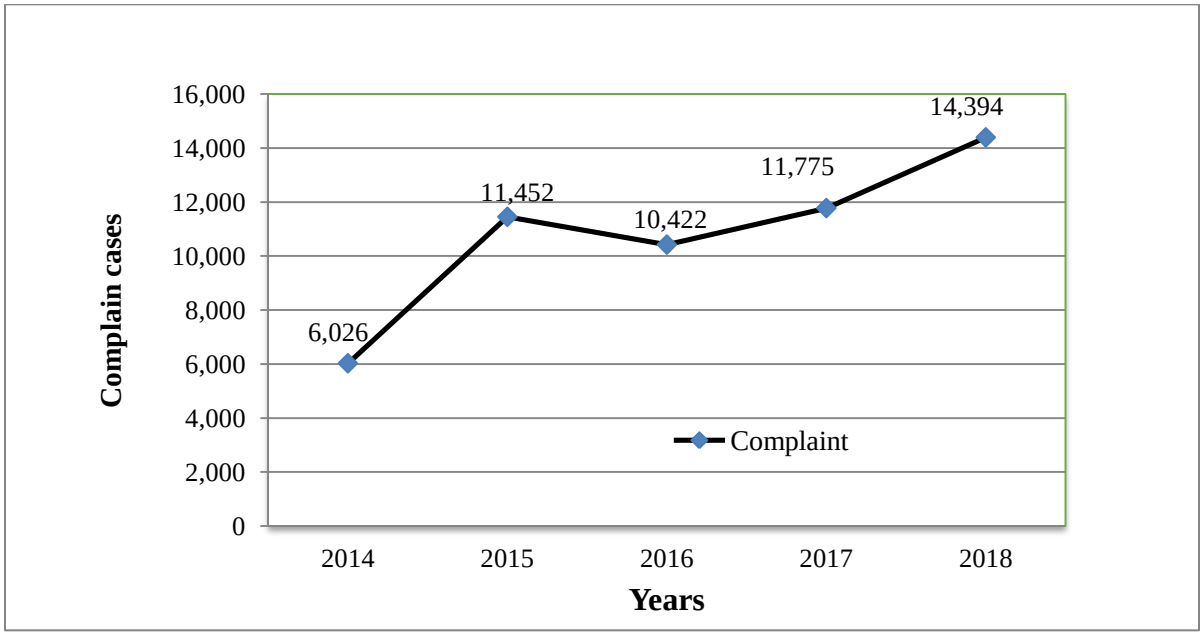

FIGURE 1
POLLUTION COMPLAINT STATISTICS IN THAILAND DURING 2014-2018

From Figure 1 represents people's pollution complaints which were found that pollution problems in Thailand during 2014-2018 tended to rapidly increase as the number in 2017 was 1,353 complaints higher than in 2016 similar to the number in 2018 compared to 2017 which was 2,619 complaints.

The eastern region of Thailand has a heavy petrochemical industry and is harmful to the environment. Therefore, when the pollution is in industrial estate in Thailand a little occur it

makes more effect. This data is show about complaint type of the eastern seaboard of Thailand can classify the complaint type as shown in Table 1.

Table 1
COMPLAINT TYPE FROM FACTORY IN INDUSTRIAL ESTATES 2014-2018

Complaint Type	Number/Year				
	2018	2017	2016	2015	2014
Smell	18	17	6	8	7
Loud noise	3	3	2	0	2
Dust	7	4	2	1	2
Waste water	4	2	2	1	1
Garbage	0	0	0	0	3
Hazardous waste	0	0	0	1	1

Note: The eastern seaboard of Thailand

From Table 1 demonstrate about complaint type of the eastern seaboard of Thailand. So, the highest number of complaints was the smell, dust, loud noise and waste water respectively**.** From above of Table 1 its tendency increases pollution in the future.

Therefore, the researcher is interested in examining the model of management guideline for pollution crisis from industrial plants in industrial estate to be used as a solution and help reducing environmental pollution problems. The research was carried out by studying the operation guideline on integral factors effecting on industrial sectors and being expected to be an impulsion for the achievement of industrial sector in reducing environmental pollution problems. The 4 important factors are 1) policy 2) knowledge management 3) innovation and technology and 4) resources which are used for solving and reducing environmental pollution problems. The study result will be used as a management guideline for pollution crisis from industrial plants in industrial estate.

Policy

Since environmental issues have many aspects, several policy instruments may be needed to adequately address each one. Furthermore, a combination of different policies may give firms greater flexibility in policy compliance and reduce uncertainty as to the cost of such compliance. Government policies must be carefully formulated so that the individual measures do not undermine one another, or create a rigid and cost-ineffective framework. Overlapping policies result in unnecessary administrative costs, increasing the cost of implementation (OECD, 2007)

Eccleston & March (2011) argue that although environmental impact assessments (EIA) are conducted to compare impacts of various policy alternatives. Moreover, it is assumed that policymakers make rational decisions based on the merits of the project. Policy makers normally have access to reasonably accurate information, political and economic factors often lead to environmentally destructive decisions in the long run. Horizon-2020 (n.d.) Synergic to the environmental policy is the environmental research and innovation policy. An example is the European environmental research and innovation policy, which aims at defining and implementing a transformative agenda to greening the economy and the society as a whole so to achieve a truly sustainable development. Europe is particularly active in this field, via a set of strategies, actions and programs to promote more and better research and innovation for building a resource-efficient, climate resilient society and thriving economy in sync with its natural environment. Therefore overall organizations are becoming more aware of their environmental

risks and performance requirements. In line with the ISO 14001 standard they are developing environmental policies suitable for their organization (Eccleston & Doub, 2012).

Knowledge Management

The changing and challenging conditions of the 21st century have been significantly impacting our economy, society and built and natural environments. Today generation of knowledge, mostly in the form of science, technology, engineering, mathematics, and arts, is seen as a panacea for the adaptation to changes and management of challenges. Making space and place that concentrate on knowledge generation, exchange, and marketing has become a priority for many nations. Consequently, the concept of knowledge city is coined at the beginning of the century and since then it is widely researched and practiced (Edvardsson et al., 2016). Therefore, knowledge management of an organization has relationships knowledge management derives their power from the knowledge they use. When knowledge developers begin the building process, the first step is capturing tacit knowledge. The next step is to find a way to codify and organize knowledge into a form for others to use when needed. Getting the right knowledge to the right people at the right time is the whole idea behind knowledge (Mohapatra et al., 2016). Today we understand that every employee is required to learn throughout life, so to acquire new knowledge, to process such knowledge and possibly disseminate expertise with other members of the organization. Principles and strategies applied by organizations yesterday could prove their inefficiency today; human resource strategies in organizations today should include a separate subcomponent, we believe, i.e. knowledge management (KM) strategy. This is because the competitive advantage obtained or maintained by the company depends today, in large proportion, on the type, quality and value of knowledge possessed by the organization. Therefore, organizational strategy and thus the strategy of acquisition, developing and rewarding of human resources (HR) should take into account this reality from the global environment. Moreover, in the current knowledge-driven economy, organizations must know how to develop and implement knowledge-based strategies to drive measurable business results. The goal of potential relation between the overall company strategy, HR strategy and KM strategy (Bordeianu & Buta, 2015)

Innovation and Technology

Technological Innovation (2018) better reflects the business consideration of improving business value by working on technological aspects of the product or services. Moreover, in a vast majority of products and services, there is not one unique technology at the heart of the system. It is the combination, the integration and interaction of different technologies that make the product or service successful. For environmental protection, innovation in products and processes is often seen as the ideal solution. Contributing to economic activity while being *"environmentally friendly"*, it tends to have the favor of all, notably industry and governments. Pestre (2019) model of open innovation by establishing an industry-level organization. In Radnejad & Vredenburg (2015) study, we explore this emerging model of open innovation and interpret its successes and failures through the use of the theoretical literature. The conceptual model that we derive combines strategic bridging organizational concepts with open innovation ideas to help us understand the building of an innovative technologies network at the industry level. Consistent with the research of Leonard-Barton (1991) competitive pressures require reciprocal innovation in both the organizations of today and in the technical

systems that they develop and use. The greater the benefits to be realized from the introduction of a new technical system, the greater the amount of organizational change that should be anticipated. Successful process innovation requires management of the mutual adaptation of technology to organization and organization to technology during design and development. According to research in the face of serious price and quality competition in technology intensive industries, especially in Asia. As we prepare to enter the next millennium, the new banner, in nation's rich and poor, is *"innovation"* (Branscomb, 2001).

Resources

Miller & Spoolman (2011) defined as a resource is a source or supply from which a benefit is produced and that has some utility. Resource with time and developing technology to produce benefit and in the process may be consumed or made unavailable. The benefits of resource utilization may include increased wealth, proper functioning of a system, or enhanced well-being. As for McConnell et al. (2011) the economics a resource is defined as a service or other asset used to produce goods and services that meet human needs and wants. The resource-based view (RBV) is a managerial framework used to determine the strategic resources a firm can exploit to achieve sustainable competitive advantage. In accordance with Barney's (1991) article *"Firm Resources and Sustained Competitive Advantage"* is widely cited as a pivotal work in the emergence of the resource-based view. Therefore, to be concluded that the assumption that is based on the resources that an organization owns are not mobile, in other words, at least in short terms, cannot be transferred from one company to another. Companies can hardly obtain the immobile resources of their competitors since those resources have an important value for companies (Jurevicius, 2013).

Objectives

To develop simulation model for management guideline pollution crisis from industrial plants in industrial estate for Thailand

Hypothesis

This research has 5 hypotheses:

H_1 *Factor on knowledge has direct influence on resource factor.*

Organization with the integrated development of research scope of knowledge creative thinking under environmental context shows positive mutual vision on environmental operation. In addition, positive relation between vision, environment and knowledge creative thinking were found a media in the operation (Chen et al., 2015). Therefore, knowledge strategy on social capital connection and success convenience of better effectiveness on environmental-innovation friendly leads to management works of innovation ecosystem (Martínez-Pérez et al., 2015).

H_2 *Factor on knowledge has direct influence on policy factor.*

Convenient operation of quality management of skill development for knowledge of environmental management in industries was found that the integration of ISO 9001 standards and other management systems including ISO 14001 are more useful compared to a company

with only one operation management system (Bernardo et al., 2011) corresponding to the study of Zhu et al. (2013) which shows that ISO 9001 can lead to the achievement of environmental management system (EMS) and the environmental impact assessment (EIA) must be evaluated before under taking every new project.

H_3 Factor on knowledge has direct influence on innovation and technology factor.

Knowledge management is important thing to input information for the organization and an intermediary of learning organization. Knowledge management significantly affects on innovative organization through organizational learning in knowledge management (KM) which greater effects on organizational innovation creativity. The manager/administrator should therefore think how to deal with overall organizational learning in knowledge management in order to reach organizational innovation creativity (Liao & Wu, 2010) corresponding to the study of Cao et al. (2015) in high increase of investment in industrial scientific research leading to easement of limitation problems in the organization via research and development (R&D) in industrial sectors, sustainable development of increasing industrial sectors via the utilization improvement of increasing resource effectiveness with involvement of innovation and technology breakthrough on GDP and the development of renewable resources in the organization.

H_4 Factor on innovation and technology has direct influence on resource factor.

IT is increasing growth in every area of business, society and private lives which gets both positive and negative attention in IT of environment and sustainable development. Positive role effects on eco-friendly activities leading to environmental protection and resource conservation and reducing negative effects, IT expert's action on pollution prevention and the improvement of product care facilitating the sustainable development (Molla et al., 2011) as an intermediary of the connection between social expectation for sustainably environmental care and the organization action (Melville, 2010). Therefore, IT expert is able to provide important in-depth information for the development of approach effecting on initiation of green business organization so that the expert can be an academician and a developer of Green IT as well as IT stakeholders who are representatives of Green Innovation (Molla & Abareshi, 2012).

H_5 Factor on innovation and technology has direct influence on policy factor.

Industrial development has progressively caused the increase of global environmental effects. Hence, the environment is a driving factor for the government and business organization to pay attention in taking solution policy into practices to solve and reduce environmental damages and pollution. A number of communities support the promotion of management idea of green business environment such as green management, green marketing, green product, and green production (Chen & Chang, 2013). Nowadays, people focus on environmental concerns and show their political power through protests. Environment will change their lifestyles. It is suggested that people should change their lifestyles into "*green business*" which can achieve goals of eco-friendly environment. Schwenk & Möser (2009) including roles of environmental regulations in stimulating innovation and the improvement of work efficiency (Lamond et al., 2010). Corresponding to the innovation and technology study of Benitez-Amado & Walczuch, (2012), it said that an important role of IT operation according to proactive strategy of environmental implementation and organizational operational work result. It is suggested that IT

manager/administrator of the organization should make decision for establishing environmental sustainability which will lead to business value caused by IT innovation and technology.

METHODOLOGY

This study has been designed as an inductive research with mixed methodology.

1. Qualitative Research using In-depth Interview technique with 9 experts including 3 experts in knowledge management business organization managers, 3 experts in human resource development government department and 3 independent scholars in knowledge management academic with structured interview from as opened-end questions followed the concept of four latent's which reviewed from theory and literature. The four latent's comprised of 1) policy 2) knowledge management 3) innovation and technology 4) resource These variables were evaluated the index of the corresponding with objective or content using Item Objective Congruence; IOC analysis that showed 0.60-1.00 value (accepted at >0.5). Finally we obtained the suitable 100 variables in 4 latent's for try-out questionnaire that evaluated the reliability from Cronbach's Alpha statistic showed at 0.975 (accepted at >0.8) and discrimination both check-list and rating-scale question items (accepted at >0.3) using Standard Deviation (S.D.) analysis obtained 0.31-1.57 and Corrected Item-Total Correlation analysis obtained 0.39-0.65 respectively.
2. The quantitative research used questionnaire surveys with managers/administrators of industrial business enterprises in Thailand that the global ISO 14001 or green industry rewards from 2007-2017, conduct a period of nine months to collect the data from 666 surveys. The 500 samples (Comrey & Lee, 2013) for statistical analysis consist of 250 data by responding to heavy industries and 250 data from light industries. The research tools for quantitative survey questionnaires were. Data analysis was conducted through descriptive statistics by SPSS referred 5 Likert's scales (Tanin, 2017). Multivariate Statistical Analysis employed Structural Equations Model (SEM) by AMOS with evaluating the Data-model Fit in 4 levels including (1) Chi-square Probability Level over 0.05 (2) Relative Chi-square less than 2 (3) Goodness of fit Index over 0.90 and (4) Root Mean Square Error of Approximation less than 0.08.
3. The model of pollution crisis from industrial business approved by 7 experts using focus group analysis techniques in qualitative research.

RESULTS

The results (Table 2) of this research in relation to the factors affecting management guideline pollution crisis from industrial plants in industrial estate for Thailand could be further discussed as follows:

Table 2
MEAN & STANDARD DEVIATION OF OVERALL SIGNIFICANCE LEVEL OF MANAGEMENT GUIDELINE FOR POLLUTION CRISIS FROM INDUSTRIAL PLANTS IN INDUSTRIAL ESTATE FOR THAILAND

Management guideline for pollution crisis from industrial plants in industrial estate	Light industry			Heavy industry		
	$\bar{x}$	S.D.	Significance Level	$\bar{x}$	S.D.	Significance Level
Overall	4.18	0.42	high	3.80	0.59	high
1. Policy	4.19	0.41	high	3.80	0.59	high
2. Knowledge	4.19	0.43	high	3.79	0.61	high
3. Innovation and Technology	4.15	0.42	high	3.79	0.57	high
4. Resources	4.19	0.44	high	3.83	0.61	high

1. The administrators of both light and heavy industries gave the importance on management guideline pollution crisis from industrial plants in industrial estate for Thailand by reporting 4 factors shown in Table 1. Table 1 presents factors in simulation model for knowledge management strategy in industrial

business showing high importance of both light and heavy industries at 4.18 and 3.80 respectively. When considering in each aspect for light industry, the importance is on every factor with the highest on policy with $\bar{x}$ = 4.19, S.D. = 0.41, followed by knowledge management with $\bar{x}$ = 4.19, S.D. = 0.43, then, resources with $\bar{x}$ = 4.19, S.D. = 0.44, and innovation and technology with $\bar{x}$ = 4.15 respectively. For heavy industry, the administrators gave high importance on every factor with highest on resources *($\bar{x}$ = 3.83)* followed by policy *($\bar{x}$ = 3.80)*; then, innovation and technology *($\bar{x}$ = 3.79, S.D. = 0.57)* and knowledge management *($\bar{x}$ = 3.79, S.D. = 0.61)* respectively.

2. The comparison of important level of management guideline pollution crisis from industrial plants in industrial estate for Thailand between light and heavy industry using independent t-test statistic in SPSS statistical program showed the statistically significant difference between mean of factors important level of light and heavy industry.
3. The evaluation of structural equation modeling of the simulation model in pollution crisis showed that the Chi-square probability level was at 0.000; relative Chi-square at 2.568, goodness of fit index at 0.671, and root mean square error of approximation at 0.056 which still could not pass the criteria of the SEM.

Thus, the researcher revised the simulation model by considering modification indices suggested by Arbuckle (2011). After the revision of the simulation model, it was found that Chi-Square Probability Level equaled 0.051, Relative Chi-square was 1.243, Goodness of fit Index was 0.970, and Root Mean Square Error of Approximation was 0.022 passing the criteria of the model fitting with the empirical data as shown in Figure 2.

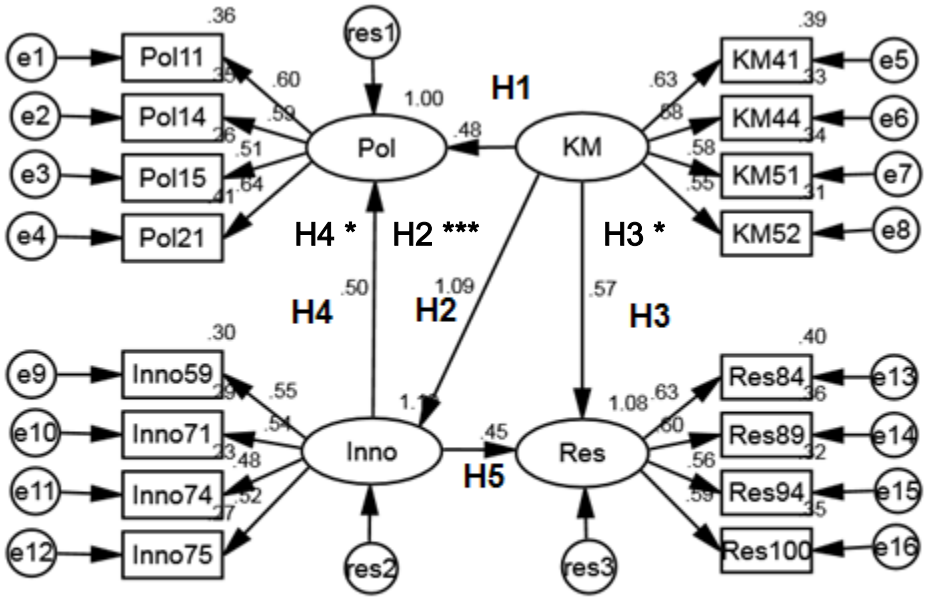

FIGURE 2
SIMULATION MODEL FOR MANAGEMENT GUIGELINE FOR POLLUTION CRISIS FROM INDUSTRIAL PLANTS IN INDUSTRIAL ESTATE IN STANDARDIZED ESTIMATE MODE

From Figure 2, the analysis result of structural equation model of management guideline pollution crisis in industrial business found the important statistic value were factor loading in standardized estimate mode at hypothesis path analysis. The hypothesis 1 (H1) clarify the influencing factors: knowledge had direct influence on resource at the statistically significant level of 0.05 at factor loading 0.48. The hypothesis 2 (H2), knowledge had direct influence on policy at the statistically significant level of 0.001 at factor loading 1.09. The hypothesis 3 (H3), knowledge had direct influence on innovation and technology at the statistically significant level of 0.05 at factor loading 0.57. The hypothesis 4 (H4), innovation and technology had direct influence on resource at the statistically significant level of 0.05 at factor loading 0.50. The hypothesis 5 (H5), innovation and technology had direct influence on policy at the statistically significant level of 0.05 at factor loading 0.45. Statistical analysis of structural equation model for knowledge management strategy in industrial business in standardized estimate mode is shown in Figure 2 and summarized in Table 3.

Table 3
STATISTICAL ANALYSIS OF STRUCTURAL EQUATION MODEL FOR MANAGEMENT GUIGELINE FOR POLLUTION CRISIS FROM INDUSTRIAL PLANTS IN INDUSTRIAL ESTATE IN STANDARDIZED ESTIMATE MODE

Variable	Estimate		R^2	P
	Standardized	Unstandardized		
Knowledge				
Policy	0.48	0.46	1.00	.041*
Innovation	1.09	0.98	1.19	***
Resources	0.57	0.61	1.08	.010*
Innovation				
Policy	0.50	0.54	1.00	.030*
Resources	0.45	0.53	1.08	.040*
Knowledge				
KM41	0.63	1.00	0.39	
KM44	0.58	0.96	0.33	***
KM51	0.58	0.96	0.34	***
KM52	0.55	0.90	0.31	***
Policy				
Pol11	0.60	1.00	0.36	
Pol14	0.59	1.03	0.35	***
Pol15	0.51	0.89	0.26	***
Pol21	0.64	1.10	0.41	***
Innovation				
Inno59	0.55	1.00	0.30	
Inno71	0.54	0.86	0.29	***
Inno74	0.48	0.85	0.23	***
Inno75	0.52	0.96	0.27	***
Resources				
Res84	0.63	1.00	0.40	
Res89	0.60	0.94	0.36	***
Res94	0.56	0.84	0.32	***
Res100	0.59	0.89	0.35	***

Noted: ***Significant level at 0.001; *Significant level at 0.05

The Factor Loading of Policy is determined as the following: for standard of pollution source in plants according to Hazardous Substance Act, B.E. 2535 (Pol 11) of 0.60, writing

report of VOCs seepage from equipment in industrial plants according to ministerial regulations, B.E. 2555 (Pol 14) of 0.59, application of "*environmental governance*" principle on social responsibility in the operations according to manuals and rules of Ministry of Industry (Pol 15) of 0.51, and establishing voluntary system for pollution crisis management incorporating with public and private sectors including involving civil society (Pol 21) of 0.64

The Factor Loading of Knowledge Management is determined as the following: for diffusion and making use of pollution crisis knowledge with provincial environment office (KM 41) of 0.63, attendance in triple entente meeting among public sector, private sector and community in order to continuously exchange information about pollution crisis management (KM 44) of 0.58, education of pollution management with community and stakeholders such as training of water and soil quality examination (KM 51) of 0.58 and knowledge management about environmental pollution for personnel participation such as environmental conservation, resource usage (KM 52) of 0.55

The Factor Loading of Innovation and Technology is determined as the following: for inviting environmental experts to incorporate in research and development of technology and industrial technical mechanism for pollution prevention and reduction due to production (Inno 59) of 0.55, setting waste management innovation referred to 4Rs principle (Reduce Reuse Recycle Recovery) as evaluation criteria of Zero Waste to Landfill) (Inno 71) of 0.54, apply using Electronic Nose: E-nose for smell inspection installed in various points in plants such as production line, inventory (Inno 74) of 0.48, and apply using Environmental Management System: EMS) with organizational environmental management. (Inno 75) of 0.52

The Factor Loading on Resources is determined as the following: for recruitment of research personnel to specifically work in environmental agencies in order to research about management of pollution crisis (Res 84) of 0.63, hiring consultant company with environmental standards to inspect environmental condition in the plant once a month or in every quarter (Res 89) of 0.60, fixing loud and vibrating machineries in the plants in order to reduce noise and the vibration from interrupting people in the area (Res 94) of 0.56, and the allocation recreational area with no pollution but facilities for personnel in the organization (Res 100) of 0.59

DISCUSSION

From the result of the difference important of four factors on management guideline pollution crisis from industrial plants in industrial estate for Thailand between the light and heavy industrial sectors at 0.05 significant level, in light industry sector gave the important level in policy factor was highest priority ($\bar{x}$=4.19, S.D. =0.41) that slightly differ from knowledge factor ($\bar{x}$=4.19, S.D. =0.43) (see in Table 1), followed by innovation and technology, resources respectively. Heavy industry gave highest important level on resources factor ($\bar{x}$=3.83) followed by policy factor ($\bar{x}$=3.80), knowledge, innovation and technology respectively. Both light industries and heavy industries gave very high importance on resources and policies of management guideline for pollution crisis from industrial plants in industrial estate in order to firstly solve or reduce environmental pollution problems.Though the heavy industrial sector gives the importance on resources at the highest factor, the researcher found that the heavy industries have long been providing more resources than that of the medium and light industries. Thus, resources are more focused for advantages and worthiness. It should be emphasized on resources to reduce maximum organizational cost. An important factor causing pollution crisis effecting on the environment is resource management of industrial plants (Thai Environment Institute, 2018). It undermines people's welfare and life quality (Boardman, 2008; Li, 2014)

corresponding to the research of Bae & Smardon (2011) which said that sustainable business must build the unity of 3 important issues: economics, society and environment.

CONCLUSION

The management guideline for pollution crisis from industrial plants in industrial estate in Thailand comprises 4 main factors which are very important on pollution crisis in industrial business of both light and heavy industries. The factors are ranked according to their important levels as follows: policy and resources in order to be management guideline for pollution crisis from industrial plants in industrial estate in Thailand.

Though, the light industrial sector gives the importance on policy at the highest factor, followed by knowledge at ($\bar{x}$=4.19, S.D. =0.41) and ($\bar{x}$=4.19, S.D. =0.43) respectively. While, the heavy industrial sector gives the importance on resources at the highest factor and followed by policy at ($\bar{x}$=3.83) and ($\bar{x}$=3.80) respectively. The researcher found business organizations of both sizes employees have different learning behaviors because they are influenced by different variables light industrial enterprise the employee's learning behavior is influenced by the perception that the management supports operations at a much higher level than heavy industrial. This may be due to light industrial the distance between the executives and employees are shorter than the heavy industrial. Therefore may make employees feel more aware of executive support than heavy industrial.

Another important guideline for the management of pollution crisis is policy making whether Quality and Environmental Management System (ISO 9001 and ISO 14001) should be used as environmental policies for the improvement of environmental management system or not in order to gain better effectiveness according to policy of environment conservation which can be used in every organization. Policy and guideline making in sustainable environmental quality promotion and conservation aims to establish natural resource management, national environmental quality promotion and conservation together with economics and social development.

Suggestion for Further Study

As a study result of management guideline for pollution crisis from industrial plants in industrial estate in Thailand, it is suggested that the models in each factor should be applied with each size of industries including various types of them as they have different production such as petrochemical industry which has all-the-time continuous production. Therefore, waste sewerage in production process causing pollution might occur all the time as well while fabrication plants run their production process from time to time. So, waste sewerage in production process causing pollution from such plants has fewer chances. However, it does not mean there will be no effects because fewer times might severely and greatly result in environment. The researcher recommends that this research should be extended by dividing into groups or types of each industry to demonstrate clearer picture.

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